

# Environmental Health of the Sor María Romero Neighborhood of the Municipality of Matagalpa Nicaragua

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**Abstract:** This article describes the environmental health situation of the population of the Sor María Romero neighborhood of Matagalpa Nicaragua. Some determinants that were reviewed were exposure to the wastewater treatment plant, the municipal landfill and environmental practices in the inhabitants. Results: There is a direct relationship between living near the wastewater treatment plant and developing communicable diseases such as pneumonia and diarrhea. The perception of pollution to the environment are the bad odors coming from the wastewater treatment plant and the landfill located behind the neighborhood. Loss of taste, smell and flies are the complaints of the population, followed by the insecurity of the neighborhood by young delinquents. Conclusions: There is a relationship due to being exposed to the wastewater treatment plant and presenting diseases such as diarrhea, pneumonia, loss of smell and taste. In the community they do not see environmental and epidemiological problems as a priority since they do not perceive them as day-to-day problems, the priority are social problems such as insecurity, the availability of drinking water and the lack of good roads. Recommendations. To the authorities of Matagalpa to relocate the (PTAR) and to sensitize the population of caring for the environment.

**Keywords:** Public Health, Epidemiology, Environment, Bad Smells

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## 1. Introduction

The quality of life and environmental conditions are one of the most important determinants for maintaining people's health, be it in individual or collective environments. For this, a correct and sustainable management of solid and liquid waste is necessary, both at the urban and rural levels. Scientific evidence suggests that an adequate perception of the environment directly influences the quality, care, protection of the ecosystem and the health of people.

Health Situation Analysis [12, 13] as part of Public Health, under the excellent MOSAFC Family and Community Health Model implemented by the good Government of Reconciliation and GRUN National Unity, start from the analysis of the health situation in 2007, which indicated problems in equity, quality, universality and warmth in the access to health services in Nicaragua. In an environment where needs are growing and resources are limited, it is up to GRUN, through the Ministry of Health, to formulate a proposal for a comprehensive humane, supportive, equitable, efficient and effective health model that integrates and seeks

the balance between human beings and the environment.

In Germany, [16] demonstrated that confined animal feeding operations can contribute to the burden of respiratory diseases among their neighbors, due to the bad odors emanating from the animals and their waste. In Italy [15] mention that odor pollution was significant for a limited area downwind near the landfill, which seems to be a significant risk factor for damage to the local environment. In Cuba [10] emphasize that epidemiological surveillance is a task for everyone, and constitutes one of the actions to be developed within the strategy of primary care, an essential function. of public health EPHF.

Gotera et al. [8] demonstrated an association between inadequate environmental sanitation and the presence of parasitism in the inhabitants. In Mexico [19] cites that pollution due to bad odors causes various health problems for people such as headaches, insomnia, nausea, vomiting, respiratory problems and negative mood, among others. [7] In Colombia, they carried out a study where they determined the association between environmental and health factors with the prevalence of respiratory conditions in the inhabitants. [4] in

the municipality of Matagalpa did write that the population receives information regarding the environment, has access to basic services and despite this, there is little or no citizen participation in caring for the environment.

From the point of view of public health, it is necessary to be clear that cleanliness in the community is synonymous with health. An analysis of the environmental health situation of the Sor María Romero neighborhood was made during the year 2021, where the perceptions of health and the environment in the studied residents were consulted. Correlational analyzes were made between the perception of health, the environment and the social determinants of the inhabitants, such as exposure to the wastewater treatment plant, exposure to the municipal landfill and how they perceive that it affects their health.

## 2. Material and Method

The information for this study was obtained with three methods. First, the semi-structured online survey was carried out with the equiprobability method, applied to the residents of the Sor María Romero neighborhood of the municipality of Matagalpa, the survey was carried out by a qualified survey team. The second method was the interview with a structured questionnaire to the Ministry of Health to find out the epidemiological data obtained from the surveillance of the 10 most frequent diseases and that were registered during the year 2021. And as a third method, an adapted environmental observation guide was used. to the Sor María Romero neighborhood and applied by the main researcher.

The online survey-type information collection instrument was validated by personnel from outside the Sor María Romero neighborhood of the municipality of Matagalpa. In the pilot process, reliability tests were submitted with Cronbach's Alpha, with a result of 0.851 where the statistically acceptable minimum is 0.8, so the data collection instrument passed the reliability test and was taken to the field.

For this research two paradigms were used, the post-positivist [1] where one of the reasons for not being able to achieve a total and absolute understanding of reality is based on the imperfection of the intellectual and perceptive mechanisms of the human being, which limits it to be able to dominate all the variables that may be present in a phenomenon as in the positivist paradigms that are used in studies with a purely quantitative approach. In response to the ontological question, this post-positivist paradigm affirms that the conception of reality is not naive as in positivism, but that it is from a reflective position, where, although it is true, reality can be considered as existing, it is imperfectly apprehensible because the phenomena are uncontrollable and the human being is imperfect [18], which forces us to go beyond a nominal or quantitative record.

The second paradigm used is the constructivist where [5] cites that in studies with a constructivist approach, a qualitative methodology is used whose research techniques use focus groups and in-depth interviews. These tools allow participants to talk about the problem on their own terms.

From this framework, the perception of air pollution is not a pre-existing phenomenon, but a social construction determined by individual and collective processes of social interaction with the environment.

According to the depth of the study, it is descriptive, correlational, retrospective, cross-sectional with a duration of 1 year, it has a mixed quantitative approach with qualitative elements. The design is non-experimental and explanatory, taking into account that mixed research is a research methodology that consists of collecting, analyzing and integrating both quantitative and qualitative research. The universe of study is N=9,300 inhabitants of the Sor María Romero neighborhood. A sample calculated with the online application of Open EPI, version 3, the open-source calculator SSPropor collected from the web page: <https://www.openepi.com/SampleSize/SSPropor.htm> With a confidence limit of 95 was available. % And a margin of error of 5%, the sample was calculated. Sample size formula  $n = [EDFF * Np(1-p)] / [(d2/Z21-\alpha/2*(N-1) + p*(1-p)]$  n=369.

For the analysis and processing of the information, the Excel operating system of the Office Professional Plus 2016 folder was used to carry out the code book and the frequency comparison of the Hanlon matrix that the Ministry of Health has under epidemiological surveillance with the name of the ten most frequent diseases and the diseases that are most felt by the population.

Subsequently, for the quantitative analysis, the data was analyzed in the statistical software IBM SPSS Statistics Version 25, property of IBM Corp. © Copyright and its licensees 1989, 2017, 64-bit edition. In the qualitative analysis, the statistical software ATLAS ti version 9, Copyright © by ATLAS Ti Scientific Software Development, was used. GmbH, Berlin. All rights reserved. Document version: 9.0.0.214 (15.12.2021 19:40:59). Author: Dr. Susanne Frieze. Where the hermeneutic unit created with the variables or open questions applied in the surveys to the population of the Sor María Romero neighborhood is used, where the data with word networks and the qualitative data report issued by ATLAS Ti were obtained and analyzed.

Before carrying out the discussion of the results, the normality test exercise was carried out on the data obtained from the 369 respondents with the application of the Kolmogórov-Smirnov and Shapiro-Wilk tests, to determine the normal behavior of the data and choose the parametric or nonparametric tests to use. The degrees of freedom (gl) are 369, which corresponds to the number of people surveyed according to the statistical sample where  $n > 50$ , the level of significance (Sig.) for each variable was less than 0.05 ( $P=0.000$ ), which means that the behavior of the data is not normal, therefore, non-parametric tests such as Spearman's Rho were used.

## 3. Results

In the Sor María Romero neighborhood, it was found that 87.5% of the population is female with 12.5% male. Regarding the number of people per dwelling, 13% of the

population live with three people in the home, 30.1% live with 4 people and 24.4% live with 5 people per house, 6% live 6 in the same house and 20.9 % reported that more than 7 people lived in the home, which constituted families with overcrowding “The World Health Organization (WHO) defines overcrowding as the “condition where the number of occupants exceeds the capacity of the living space”; the indicator 3 or more people living in the same room”.

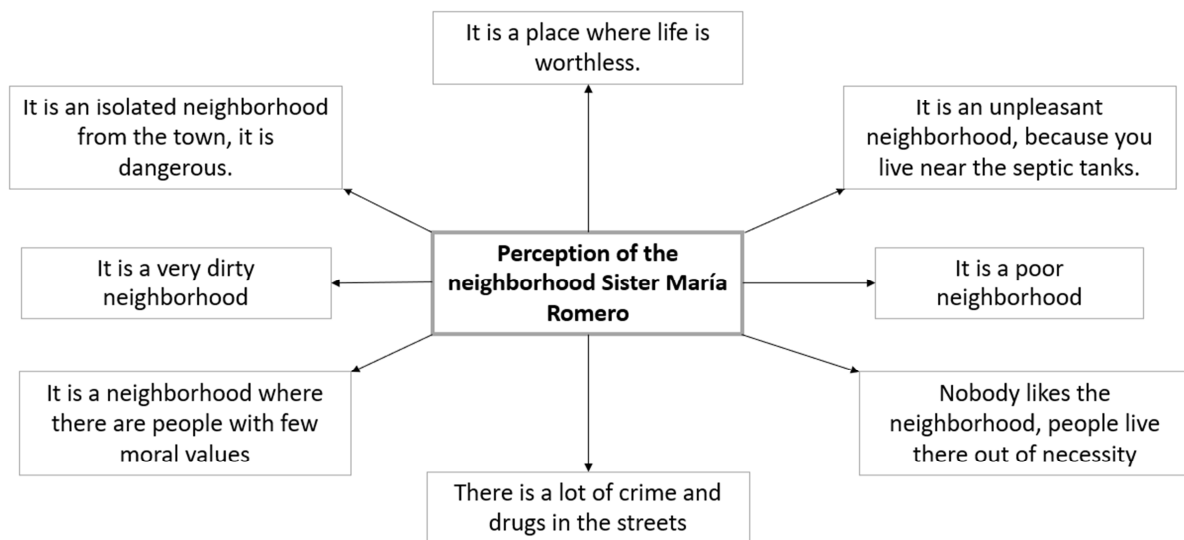
32.5% of the study population reported having gone at least once to the municipal garbage dump behind the Sor María Romero neighborhood, 34.1% of people used to go out to cut firewood, and only 30.4% of the study population reported who have given or are giving talks on caring for the environment, to this is added that 70% of the population considers that there is no citizen participation in the neighborhood, so they believe that for this reason there are no improvements in the community, with respect to Regarding the use of agrochemicals, only 16.3% report that they have used some type of agrochemical in their home or community.

Regarding the satisfaction of basic needs, 94.9% of the population reports that they have access to piped drinking water, but it is not available all the time, 100% of them mentioned that they have electricity in their homes, 100% of them have access to the health center less than 30 minutes walking, likewise 100% of the population mentioned that they have access to public transportation to go downtown and important places in Matagalpa, 96.7% mentioned that the bus of the garbage goes through their homes, the rest, which is 3.3%, reported that they did not go through their homes but that they did deliver the garbage to the collection truck, and finally, 71% of the population reported that they have a toilet

in their house against 28.2% who reported that they had latrines, although in poor condition it was determined that there are no fecalism practices in the open air.

Martínez Abreu, J. [11] cites that an adequate drinking water supply, liquid and solid waste deposit optimally at home and in the community, is theoretically associated, which influences the improvement of people's quality of life. In the qualitative analysis of the surveys applied to the inhabitants of the Sor María Romero neighborhood of Matagalpa, in a first-order explanation it was found that the perception of the population is that the neighborhood is dangerous due to the number of young people at risk of what people call them "vagrants or criminals", this same perception is repeated on numerous occasions where they complement it with the fact that there are bad people, it is a neighborhood where there is a high incidence of drug addiction by young people and adults, fake sales and that it is a neighborhood where one lives out of necessity, so this data corresponded to the unexpected data.

The study population does not mention much about how they perceive the environment, the only allusion to this part is when they talk about the neighborhood being unpleasant because they have to live with the septic tanks (PTAR) this data was as expected but it was only Mentioned a few times, the non-data or what the population did not mention is that the neighborhood has environmental problems beyond the septic tanks as they produce bad odors, the neighborhood does not have a good final waste disposal flow solid in the streets despite the fact that at the end of the neighborhood there is a municipal garbage dump.



Source: Hermeneutic unit of the qualitative analysis of surveys processed in atlas ti 9.

**Figure 1.** Residents' perception of the Sor María Romero (SMR) neighborhood.

Another unexpected first-order piece of information is that the population sees the social construct of young people at risk as the main problem in the perception of the neighborhood's ecosystem, so the priority for this from the community point of view is to find a way out of the problem

of youth at risk “vagrants and delinquents” the population of the neighborhood has the perception that it is a dangerous, long and unpleasant place due to the fact that it has septic tanks at the entrance.

In this sense, figure 1 mentions the following quotes from

the residents of the Sor María Romero neighborhood, these quotes correspond to first-order concepts where they speak of the dangerousness of the neighborhood where, according to the [17] as a concept of dangers applied to the neighborhood is "That is at risk or can cause harm" in the same way the population mentions social problems such as that the neighborhood is ugly because of the bums "Lazy, lazy, little worker. Said of a person without a job and poorly entertained.

According to the housing trend in Table 1, it was possible to appreciate that 79.1% of the population owns their own home, 8.9% rent the house where they live and 11.9% of the

population has a borrowed house that belongs to a friend or relative. Now that 79.1% of the population that reported having their own homes, not all of them have decent housing conditions as shown in figure 2, nor do they have the conditions to say that there is no overcrowding inside their homes, this detail becomes a social problem, which transcends living conditions, since it is a first step to be susceptible to vector-borne, respiratory diseases such as pneumonia and tuberculosis where it has already been defined that overcrowding is a risk factor for develop tuberculosis.

*Table 1. State of the housing trend.*

		Frequency	Percentage	valid percentage	Accumulated percentage
Valid	Rented	33	8.9	8.9	8.9
	borrowed	44	11.9	11.9	20.9
	own	292	79.1	79.1	100.0
	Total	369	100.0	100.0	

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

Table 2 shows that the educational level of the people surveyed mostly knows how to read and write with 44.2% of the population, followed by people who did not finish high school with 15.4%, incomplete primary school 14.1%, 13.6% have a bachelor's degree and only 2.2% are university students and 1.1% have already reached the professional level in some university degree. We see that in

neighborhoods with social characteristics such as those of Sor María Romero, it is difficult to find people with higher academic levels who have a vision and critical thinking towards society and the social construct of community problems, only 3.3%, which is the sum of those who reached a university and professional level are those who are currently living in the neighborhood.

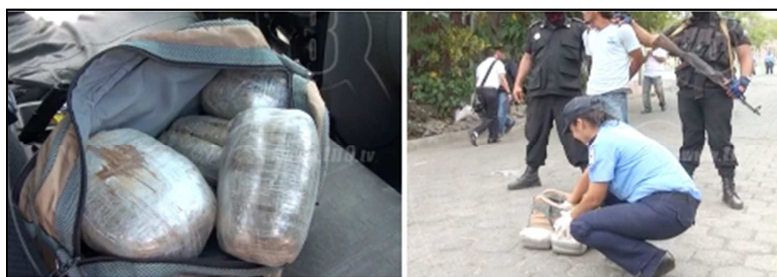
*Table 2. Level of education of the head of the family or respondent.*

		Frequency	Percentage	valid percentage	Accumulated percentage
Valid	He does not know to read nor to write	twenty-one	5.7	5.7	5.7
	knows how to read and write	163	44.2	44.2	49.9
	incomplete primary	52	14.1	14.1	64.0
	6th grade passed	14	3.8	3.8	67.8
	Incomplete High School	57	15.4	15.4	83.2
	Bachelor	fifty	13.6	13.6	96.7
	academic	8	2.2	2.2	98.9
	Professional	4	1.1	1.1	100.0
	Total	369	100.0	100.0	

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

It is as if being born and going to live in neighborhoods such as Sor María Romero act as risk factors for not developing the desire to excel through legal or academic means, where the easiest option is to leave home to look for food of the day without knowing if it will return safe and sound, the issue is that some do it in the traditional and legal way and other residents do it not so

legally, the goal is to survive at all costs, this is what the same women say people from the neighborhood who cite that "Sor María Romero's neighborhood is horrible to live in, that you live out of necessity and your family members do not visit, there are many problems with the sale of drugs and glue here." Figure 2.



Source: TN8. [21]

*Figure 2. They occupy several kilos of marijuana in a house in the Sor María Romero neighborhood.*

Table 3 shows the data from the correlational analysis of the hypothesis statement in relation to the level of education and littering the streets as a common practice.

- 1) Ha: The higher the level of education there is a greater interest in protecting the environment and not leaving

garbage in the streets.

- 2) Ho: The level of education has nothing to do with the protection of the environment, the population always leaves garbage in the streets.

**Table 3.** Relationship between the variables Level of education and leaving garbage on the streets.

			Education level of the head of household or respondent.	Have you sometimes left or thrown garbage on the streets?
Spearman's Rho	Education level of the head of household or respondent.	Correlation coefficient	1,000	-.143 **
		Next (bilateral)	.	.006
		No.	369	369
	Have you sometimes left or thrown garbage on the streets?	Correlation coefficient	-.143 **	1,000
		Next (bilateral)	.006	.
		No.	369	369

\*\* The correlation is significant at the 0.01 level (bilateral).

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

The P value calculated in Table 3 is 0.006, which is less than 0.01 alpha ( $0.006 < 0.01$ ), therefore the null hypothesis is rejected and the researcher's alternative hypothesis is accepted (Ha: A greater level of education there is greater interest in protecting the environment and not leaving garbage in the streets).

Spearman's Rho coefficient is -0.143, which means that their relationship between the variables is inverse, and their degree of correlation is very low negative, which means that the higher the level of schooling, the number of times the variables are expected to decrease. people leave or litter the streets. It can be affirmed with 99% confidence that there is an inverse relationship, but with a very low degree of negative association, between the level of schooling and leaving garbage on the streets by the residents of the Sor María Romero neighborhood of Matagalpa.

This very low negative inverse relationship is consistent with social practice, since the fact of reaching a high level of education does not guarantee that good environmental care and protection practices are acquired. In Art. 123 of Law 217 published in [9] clearly mentions that the direct dumping of polluting substances or waste into soils, rivers, lakes, lagoons and any other watercourse is prohibited. The Ministry of Health, in coordination with the Ministry of the Environment and Natural Resources, will dictate the rules for the disposal, disposal or elimination of substances, materials and products or their containers, which due to their toxic nature can

contaminate the soil, the subsoil, aquifers, surface waters.

In low-income countries, children under the age of three experience, on average, three episodes of diarrhea per year. Each episode deprives the child of nutrients necessary for growth. Consequently, diarrhea is a major cause of malnutrition, and malnourished children are more likely to become ill with diarrheal diseases [14] which becomes a repetitive cycle of the manifestation of these pathologies in children.

Environmental pollution lies in the affectation of soils, watersheds and the atmosphere. [2] define it as "The presence of substances in the atmosphere, resulting from human activities or natural processes, present in sufficient concentration, for a sufficient time and under such circumstances, that they interfere with comfort, health or well-being. from humans or the environment.

As a concept of environmental perception, the authors [3] define it as: Perception "consists of the reflection in the human consciousness of objects or phenomena, by acting directly on the senses, during which process the regulation and unification of isolated sensations occur in integral reflections of things and events"

The population of the Sor María Romero neighborhood has the perception that the wastewater treatment plant contaminates the environment and the large river of Matagalpa through the communication that exists from the plant to the river. Figure 3.



Source: Photo taken by the author with a SAMSUNG A32 cell phone and Google Earth.

**Figure 3.** Evidence of the communication of the WWTP with the Rio Grande de Matagalpa. [6]

The population of the Sor María Romero neighborhood has the perception that the wastewater treatment plant contaminates the environment and the large river of Matagalpa through the communication that exists from the plant to the river, it can be seen in Figure 3 where in the visual inspection through the observation guide applied by the researcher, this communication is evidenced, and it is confirmed with the photograph of the satellite inspection with Google Earth.

In relation to the loss of smell, loss of taste and flavor of

food, to give way to this objective and to know the perception of the inhabitants in relation to exposure to bad odors, the following hypotheses are proposed, which are contrasted in the table 4.

Ha: The residents of the Sor María Romero neighborhood of Matagalpa have the perception that they have lost the taste or flavor of food and smell at the same time.

Ho: The inhabitants of the Sor María Romero neighborhood of Matagalpa do not have the perception of loss of taste or taste of food and smell at the same time.

**Table 4.** Relationship between loss of smell, loss of taste or flavor of food.

		Loss of taste or flavor to food	loss of smell
Spearman's Rho	Correlation coefficient	1,000	.934 **
	Next (bilateral)	.	.000
	No.	369	369
	Correlation coefficient	.934 **	1,000
	Next (bilateral)	.000	.
	No.	369	369

\*\* . The correlation is significant at the 0.01 level (bilateral).

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

The P value calculated in Table 4 is 0.000, which is less than 0.01 alpha ( $0.000 < 0.01$ ), therefore the null hypothesis is rejected and the researcher's alternative hypothesis is accepted (Ha: The residents from the Sor María Romero neighborhood of Matagalpa have the perception that they have lost the taste or flavor of food and smell). Spearman's Rho coefficient is 0.934, which means that its relationship of the variables is direct, positive and very high, which means that if it presents loss of smell, it will surely end up presenting loss of taste and vice versa.

In this sense, the study was carried out with the perspective of looking back in time, exactly in the year 2021, retrospective analysis, because the pandemic is still active worldwide, they were asked if the loss of smell, taste or taste of food is something that they had already manifested before the COVID 19 pandemic where the population reported that this problem is old-fashioned, but that at the time it worsened during the pandemic due to the fact that COVID 19 presented this symptom as one of the most common.

Therefore, it can be affirmed that with 99% confidence that there is a direct, very high positive relationship between

the variables loss of smell and loss of taste or flavor of food in the residents of the Sor María Romero Matagalpa neighborhood, therefore, the decrease or increase of one of these variables will have a direct and similar repercussion with the other variable due to its very high, almost perfect relationship, in relation to this the population offers certain recommendations, which should be of interest to the authorities of Matagalpa, the strongest recommendation is to change the batteries where they are.

Subsequently, in table 5, it was consulted that if the septic tanks or wastewater treatment plant caused them discomfort, it was observed that 76.2% of the population reported that the septic tanks caused them discomfort when they breathe, and 23.8% of the population mention that there are no problems with the septic tanks being in the place where they are, here it can be analyzed that depending on the location of the house and as long as it is not in the line of air currents and/or winds they will not have problems with odors emitted by septic tanks, this coincides with the data of [15] that demonstrated affection in residents exposed to bad odors that were downwind.

**Table 5.** Question about whether septic tanks cause you discomfort.

		Frequency	Percentage	valid percentage	Accumulated percentage
Valid	NO	88	23.8	23.8	23.8
	YEAH	281	76.2	76.2	100.0
	Total	369	100.0	100.0	

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

In order to know the perception of the population about the environmental situation, two hypotheses are proposed: if the batteries cause discomfort and that if these discomforts are the bad odors of feces or rotten mud, then these two hypotheses will be tested. in table 6.

Ha: The septic tanks cause discomfort such as the bad smell of fecal feces and rotten mud, in the residents of the Sor María Romero Matagalpa neighborhood.

Ho: The septic tanks do not cause discomfort such as the bad smell of fecal feces and rotten mud, in the residents of



the Sor María Romero Matagalpa neighborhood.

**Table 6.** Relationship between the discomfort of septic tanks with bad smell of rotten mud and bad smell of feces.

			Do septic tanks bother you?	bad smell of rotten mud	Bad smell of feces
Spearman's Rho	Do septic tanks bother you?	Correlation coefficient	1,000	.677 **	.544 **
		Next (bilateral)	.	.000	.000
		No.	369	369	369
	bad smell of rotten mud	Correlation coefficient	.677 **	1,000	.714 **
		Next (bilateral)	.000	.	.000
		No.	369	369	369
	Bad smell of feces	Correlation coefficient	.544 **	.714 **	1,000
		Next (bilateral)	.000	.000	.
		No.	369	369	369

\*\* . The correlation is significant at the 0.01 level (bilateral).

Source: Survey applied to residents of the Sor María Romero Matagalpa neighborhood.

The P value calculated in Table 6 is 0.000, which is less than 0.01 alpha ( $0.000 < 0.01$ ), therefore the null hypothesis is rejected and the researcher's alternative hypothesis is accepted (Ha: The batteries Septic causes discomfort such as the bad smell of fecal feces and rotten mud, in the residents of the Sor María Romero Matagalpa neighborhood). Spearman's Rho coefficient is 0.677 in the variables that the septic tanks cause discomfort and the discomfort is a bad smell of rotten mud, its relationship of the variables is direct, positive and of a high degree of relationship, which means that One variable directly influences the other.

In the same way, with the relationship that the septic tanks cause discomfort and the discomforts are Bad smell of fecal feces, its P value is 0.000, which is less than 0.01 alpha ( $0.000 < 0.01$ ), so that the null hypothesis is rejected and the acceptance of the researcher's alternative hypothesis is ratified (Ha: Septic batteries cause discomfort such as the bad smell of fecal feces and rotten mud, in the residents of the Sor María Romero Matagalpa neighborhood).

Spearman's Rho coefficient is 0.544 in the variables that the septic tanks cause discomfort and the discomfort is a bad smell of fecal feces, the relationship of the variables is direct and of a moderate degree of relationship, which means that one of the variables directly influence each other.

**Table 7.** The ten most frequent MINSA diseases in the Sor María Romero neighborhood.

Most frequent diseases in 2021	Frequency
Acute Respiratory Infection	1,109
Arterial hypertension	587
Parasitosis	493
Arthritis	391
Urinary tract infection	282
Diabetes	202
Epilepsy	199
Acute Diarrheal Diseases	150
Congestive Heart Failure	64
Asthma	58
Other Causes	8,556
TOTAL	12,091

Source: Own elaboration based on statistical data from MINSA.

Table 7 shows the behavior of the 10 most frequent MINSA diseases, in the Sor María Romero neighborhood

during 2021, in relation to acute respiratory infections (ARI) it is observed that there are more cases in the Sor María Romero neighborhood with 1,109 cases registered throughout the year, with Acute Diarrheal Diseases (ADD) it is observed that a total of 150 cases were registered and that MINSA always continues to report cases of parasitosis even though the population does not perceive it as a medical problem.

According to the South Coast Air Quality Management District [20] High levels of air pollution can cause immediate health problems: aggravate cardiovascular and respiratory diseases, put more stress on the heart and lungs that have to work harder to supply oxygen to the body, damage the cells of the respiratory system. Prolonged exposure to polluted air can have permanent health effects: Accelerated aging of the lungs and loss of lung capacity, decreased lung function, Development of diseases such as asthma, bronchitis, emphysema and possibly cancer, Shortening of life.

## 4. Conclusions

- 1) The basic needs of the neighborhood are covered, 9 out of 10 people report that they have access to piped drinking water, although it is not always available.
- 2) 100% of the residents of the Sor María Romero neighborhood have access to electricity, urban public transportation that reaches the center of Matagalpa, access to the public health center under the control of the Ministry of Health.
- 3) Even though the residents of the Sor María Romero neighborhood are exposed to the wastewater or sewage treatment plant, and are on the route to the municipal garbage dump, they did not perceive medical diseases as a health problem to prioritize.
- 4) Unfortunately for everyone, the population of the Sor María Romero neighborhood of Matagalpa does not want to take responsibility for caring for the environment, more than half of the population attributes responsibility to a third person such as the Municipal Mayor and the MINSA, only 1/3 of the population is aware that responsibility for the environment, its restoration and protection, is

everyone's responsibility.

- 5) Among the environmental, medical and social problems consulted, the population's priority is to solve the problem of crime, improve the perception of citizen security, they do not conceive that the environmental problems that affect their health are of greater importance.
- 6) There is a direct and moderate positive relationship between the variables "The wastewater or sewage treatment plant causes discomfort such as a bad smell of feces and rotten mud in the residents of the Sor María Romero Matagalpa neighborhood," which means that eliminating the factor that generates bad odors will improve the population's perception in relation to the quality of life and environmental quality in the Sor María Romero neighborhood of Matagalpa.
- 7) The months with the greatest environmental impact due to bad odors from the wastewater or sewage treatment plant correspond from July to December, a season that coincides with winter.

## 5. Recommendation

- 1) The first recommendation to the municipal authorities of Matagalpa is to relocate the wastewater treatment plant to a place where it is not currently inhabited or provides the conditions for future habitability, as happened with the Sor María Romero neighborhood in Matagalpa, this It would improve the quality of life of the surrounding residents and raise the tourist image of the department of Matagalpa by removing the plants from the entrance to the city.
- 2) To the mayor of Matagalpa, INAFOR, INATEC, ENACAL, IPSA, UNAN Managua FAREM Matagalpa and departmental and municipal Political Secretaries, as a measure to mitigate permanent damage to public health, the environment and inhabitants living near the plant wastewater or sewage treatment plant and the municipal landfill, it is recommended to reforest the polygon of the wastewater treatment plant property, with the aim of creating a natural wind curtain, so that when there is sun, rain or wind, bad odors are filtered by the trees and/or emitted upward into the sky, instead of horizontally in the path of the Matagalpa air current.
- 3) Regarding the municipal garbage dump, it is recommended that the Matagalpa mayor's office close it, since it is temporarily used for some types of solid waste. It is important that this problem is not carried to another place where other vulnerable people live.
- 4) It is recommended to the UNAN Managua FAREM Matagalpa that when community interventions are carried out in the careers of medicine and surgery, nursing, social work, psychology and in postgraduate studies through the different modules, it coordinates with the municipal and community authorities to be able to make interventions in the Sor María Romero

neighborhood, from the perspective of primary prevention, community education, about the legal consequences of damaging the environment, make known the rights and duties of the population in the care and restoration of the environment and guide good family practices in health care.

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